

REVIEW ARTICLE

## A REVIEW ON ANTHRAX A ZOOONOTIC DISEASE AND ITS IMPACT IN ANIMALS AND PUBLIC HEALTH

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### ABSTRACT

Anthrax is an ancient disease which is per acute with the zoonotic importance. It is caused by B.anthraxis, a grama positive spore which produces a toxin. Infection occur when the spore enter the body through a caut, abrasion, or open spore. Spore can survive many years in the soil. The severity of the disease is due to production of endotoxin. The endotoxin has three components: Edema factor, protective antigen and lethal factor. It has been typically seen associated with 3 forms of infection generally in human: Cutaneous, gastrointestinal, and inhalational. Cutaneous anthrax is the most common. Early symptoms with other disease forms can be non-specific and mistaken for less lethal condition. Antibiotics are the mostly use for its treatment. Prompt for the control and prevention of the emerging disease, the contagious disease anthrax there is used of anti-anthrax serum vaccination.

**KEYWORDS:** Bacillus anthracis, anthrax, cutaneous, lethal, anti-serum, treatment

### INTRODUCTION

Anthrax known as Bacillus anthracis which is caused by the spore forming. Bacillus anthracis. It is per acute disease characterized by septicemia and sudden death with the exudation of tarry blood from the body orifices. Anthrax is also known as splenic fever, Siberian ulcer and wool's sorter disease. Anthrax is common in wild and domestic herbivores such as cattle, goat, sheep, dog, horse and less in camels. It can be seen in people who exposed to tissue from infected animals and the contaminated products. Animals that are grazing may become infected when they ingest sufficient quantities of the spores from the soil. The other way is to direct transmission, biting flies may mechanically transmit B anthracis spores from one animal to another.

Anthrax which has been reported from nearly every continent and is the most common in agricultural region. The cases of human may follow contact with contaminated carcasses or animal products. This was used as a successfully as a weapon of terrorism in 2001, killing 5 people and causing disease in 22 (Whitney, 2003).

Outbreak originating from a soil borne infection always occurs after a major climate change.

### ETIOLOGY

Anthrax infection is caused by the spore forming bacterium called Bacillus anthracis. B anthracis is a large, gram-positive, non motile aerobic bacillus measuring 1.0 to 1.5 micrometers by 3.0 to 10 micrometers. Unlike other Bacillus species, B anthracis is non hemolytic. B anthracis is also a facultative anaerobe. A prominent capsule forms in the presence of bicarbonate and carbon dioxide. Resistant 1- to 2-micrometer spores form when soil nutrients have been depleted. The organisms can be grown on blood agar under aerobic condition. Even it can be cultured on most of the cultural media.

### MODE OF TRANSMISSION

When the spores enter the body through a cut, abrasion, or open sore, referred to as cutaneous anthrax, or by ingestion or inhalation of the spores, it occurs infection. Once inside the body, anthrax spores germinate into bacteria that then multiply and secrete three proteins: protective antigen (PA), lethal factor (LF), and edema factor (EF). Individually these proteins are non-toxic, but

they can become lethal if allowed to combine and interact on and within the cells of the exposed human or animal. The pH and humidity of the soil have got some clinical aberrance on the spread disease. Carnivore's animals may carry the infection to the distant places. It may contact the infection through ingestion of contaminated carcasses.

### SUSCEPTIBLE HOSTS

There is affected to the most of the animals which shows the anthrax. Cattle and sheep are most affecting animals. Next in order is horse and pig. Algerian sheep are resistant (Blood et al., 1983). Anthrax has been recorded in dogs, though dog is thought to be resistant to anthrax (Konrak, 1967). Birds are refractory to natural infection but outbreaks have been reported in chicken (Okolo, 1985). The disease is not uncommon in cattle. Anthrax has been reported against elephants (Evans, 1910; Lyson, 1973).

### PATHOGENESIS

Anthrax spore is entering in the pharynx and through this settle in the small intestine with unaffected by gastric juice present in the small intestine. After that it show the vegetative form and the lymph nodes to lymphatic channel to the blood stream and the bone marrow where there is fulminating septicemia and at last cause the death. (A text book of preventive medicine by Amalendu Chakrabarti)

Similarly, Anthrax bacilli make the lysis and the toxin damage the vascular endothelium with hemorrhage with exudates in the body cavities and there is impairment of blood coagulation. (A text book of Preventive Medicine by Amalendu Chakrabarti)

### RECENT FINDINGS

Anthrax like disease is killing animals in Africa which started to be ordinary dead chimpanzee. (<http://time.com/4484152/anthrax-disease-animals-africa/>). There is a deadly anthrax outbreak in Zambia caused by hippo meat which is published in August 18, 2017 by Zika Resource Center. There is also recent news published in September 14, 2017 that anthrax downs 42 hippos in Tanzania's Ruaha national Park by TEFL, Thailand. In recent, North Korean soldiers working on biological weapons projects that found anthrax in defector raises. In latest news in Nepal, A pregnant rhino was found dead at Amaltari in Kawasoti Municipality-17, Nawalparasi. Initial examination proved the rhino was infected by

anthrax bacteria, an airborne disease, which is spread in humid condition (The Kathmandu Post, August 1, 2017)

### SYMPTOMS

Typically, the incubation period is 3-7 days. The per acute form which is characterized by a rapidly fatal course and sudden onset. It also shows staggering, dyspnea, trembling, collapse and a few convulsive movements and death may occur in cattle, sheep, or goats with only evidence of illness.

There is a high fever up to 107 F with depression weakness, bloody discharge from body orifices, cyanosis.

Anthrax occurs in at least 3 forms which are determined by the length of clinical course of the disease

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- Per-acute form (1-2 hrs duration).
  - Acute form (24-48 hrs duration).
  - Sub-acute or chronic form.
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#### Per-acute form

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- This form often affects cattle, sheep and goat at the start of an outbreak.
  - Fever up to 107°F, muscle tremor, respiratory distress, convulsion & death
  - After death, there may be a bloody discharge from the natural orifices of the body, rapid bloating, a lack of rigor mortis, and the presence of un-clotted blood.
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#### Acute forms

This is common in cattle, sheep and horse. Affected animals may have a high fever, complete anorexia, diarrhea, severe depressions and listlessness with advance of the disease, there becomes muscular tremors. There may be local edema of the tongue with accumulation of edematous fluid and edema of throat, sternum, perineum and flank.

#### Sub-acute to chronic localized form

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- The characteristic swelling of neck secondary to regional lymph nodes involvement which causes dysphasia and dyspnoea following ingestion of bacteria.
- Chronic gastro-intestinal form of anthrax is characterized by signs of constipation, enteritis and

diarrhea. Many carnivores have apparently a natural resistance and recovery is not uncommon.

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### **In Human**

There is different form of symptoms which affected to the body of human. Among them are:

#### **Cutaneous Anthrax**

The infection of cutaneous anthrax enters in the body through cut and sore of the skin. This form is mildest type and with appropriate treatment also causes fatal to human. The different signs of this form include itchy and same related to skin bite with develops of painless with the black centre. There is swollen nearby lymph nodes.

#### **Gastrointestinal Anthrax**

This type of anthrax which is caused by eating undercooked meat of the animals which are infected. The symptoms shown by this form includes: nausea, vomiting, headache, swollen neck, sore throat and difficult in the breathing, fever and bloody diarrhea at the later stage.

#### **Inhalation Anthrax**

This form is also known as pulmonary anthrax. It is often caused by breathing in the spore containing environment. It is most common among and with appropriate treatment also causes the fatal of human. The initial sign and symptoms include: Flu-like symptoms, such as sore throat, mild fever, fatigue and muscle aches, which may last a few hours or days and mild chest discomfort, shortness of breath, nausea, coughing up blood and painful swallowing. As the disease progresses there is high fever, trouble breathing, shock and meningitis — a potentially life-threatening inflammation of the brain and spinal cord.

#### **Injection Anthrax**

It is the latest finding form and it is because when the illegal drugs are injecting in the body through the route of injection. This form shows the redness along the site of injection, swelling. As the disease stay long will cause the failure of the organs, shock and also causes the meningitis.

#### **Treatment**

Many antibiotics are effective against B. anthracis and include the following:

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- Doxycycline (Vibramycin)

- Penicillin
  - Amoxicillin (Trimox, Amoxil, Biomox)
  - Ampicillin (Marcillin, Omnipen, Polycillin, Principen, Totacillin)
  - Ciprofloxacin (Cipro)
  - Levofloxacin (Levaquin)
  - Gatifloxacin (Tequin)
  - Chloramphenicol (Chloromycetin)
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Antibiotics and anti-anthrax serum are most commonly used. Severely ill people may be given medications through an IV. Treatment may continue for several weeks. People exposed to anthrax may be given preventive antibiotics usually to be taken for 60 days.

For animals anti anthrax serum @ 100-200 c.cc through intravenous route along with a course of penicillin may be given. Where the disease is continuing prophylactic treatment with long active antibiotic is suggested (Cartnright, 1987)

#### **Control**

It is necessary at the time to avoid unnecessary waste and the imposition of unnecessarily harsh. When an outbreak occurs the placing of the farm in quarantine, the destruction of discharge and the vaccination of survivors. Prohibition of movement of milk and meat from the farm during the quarantine period should prevent entry of the infection into the human food chain. Hygiene is the biggest single factor in the preventions of the spread of the disease. Careful disposal of infected materials is most important. Infected carcasses should not be opened but immediately burned or buried, together with bedding and soil contaminated by discharges.

In case of human care, there must be seeking of laboratory confirmation with find out the occupation of the patients. Seek out the source of infection and arrange the isolation of the patient in the hospital and used of drug of choice but if contraindicated in such cases, tetracycline, cholramphenicol, ciprofloxacin may be used with efficacy. For people, post exposure prophylaxis against B anthracis is recommended after an aerosol exposure to B anthracis spores.

#### **CONCLUSION**

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Hence bacillus anthracis which can live a long time in the soil play importance role in the transmission of the contagious disease; anthrax. The proper hygiene and prevention measure should be taken carefully. In anthrax carcass decomposes rapidly with formation of gas and distension of abdomen. Rigor mortis is absent. The connective tissues and lymphatic tissues and lymphatic glands of the region are swollen and edematous with jelly like appearance. It is the emerging outbreak in different continent and hence should be taken precaution measures.

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